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A STUDY OF CHANGING PATTERN OF RAIN WATER HARVESTING MANAGEMENT AN ANCIENT TO MODERN AGE IN INDIA - A GEOGRAPHICAL ANALYSIS

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Abstract:

In the present scenario management and distribution of water has become centralized. People depend on government system, which has resulted in disruption of community participation in water management and collapse of traditional water harvesting system. As the water crisis continues to become severe, there is a dire need of reform in water management system and revival of traditional systems. Scientific and technological studies need to be carried out to assess present status so as to suggest suitable mitigative measures for the revival to traditional system/wisdom. Revival process should necessarily be backed by people's initiative and active public participation. Living creatures of the universe are made of five basic elements, viz., Earth, Water, Fire, Air and Sky. Obviously, water is one of the most important elements and no creature can survive without it. Despite having a great regard for water, we seem to have failed to address this sector seriously. Human being could not save and conserve water and its sources, probably because of its availability in abundance. But this irresponsible attitude resulted in deterioration of water bodies with respect to quantity and quality both. Now, situation has arrived when even a single drop of water matters. However, "Better late than never", we have not realized the seriousness of this issue and initiated efforts to overcome those problems.

KEY WORDS:

Rainwater harvesting, Rooftop, catchment Area, Ahar, Khadin.

INTRODUCTION

Rising population, growing industrialization, and expanding agriculture have pushed up the demand for water. Efforts have been made to collect water building dams and reservoirs and digging well's. The country has also tried to recycle and desalinate (remove salts) water. Water conservation has become the need of the day. The idea of ground water recharging by harvesting rainwater is gaining importance in many cities. In the forests, water seeps gently into the ground as vegetation breaks the fall. This groundwater in turn feeds wells, lakes, and rivers. Protecting forests means protecting water catchments'. In ancient India people believed that forests were the Mother's of river's and worshipped the sources of these water bodies.

OBJECTIVE:

- 1) To understand the concept of rainwater harvesting.
- 2) To study the methods of rainwater harvesting in India.
- 3) To analyze the pattern of changing water management in ancient to modern age.
- 4) To draw conclusions and find out the rainwater harvesting suitable remedies to solve them.

Database and Methodology:

Present research work is based on the secondary data obtained from various journals; other related references books, socio-economic abstract of India Government Regional Water development other Scheme and various websites.

A) Concept of rainwater harvesting

“ Rainwater harvesting is collection and storage of rain water that runs off from foot tops, parks, roads, open grounds, etc. this water runoff can be either stored or recharged into the ground water” This happens naturally in open rural areas. but in congested, over-paved metropolitan cities, we need to create methods to capture the rainwater.

The term rainwater harvesting is being frequently used these days; however, the concept of water harvesting is not India. Water harvesting techniques had been evolved and developed centuries ago.

Ground water resource gets naturally recharged through percolation. But due to indiscriminate development are urbanization, exposed water resource. Rainwater harvesting is the process of augmenting the natural filtration of rainwater underground formation by some artificial methods. “Conscious collection and storage of rainwater to cater to demand water, for drinking, domestic, purpose & irrigation is termed as Rainwater Harvesting.

Significance of Rainwater Harvesting:

1. Water availability per capita has been on the decline in India. Two reasons have been the increasing demand for water and the increasing population. The quantum of water available to the country being fixed the increasing demand reduces per capita water availability.
2. Due to rapid urbanization, percolation of rain water into the sub-soil has decreased drastically and recharging of ground water has diminished.
3. Ground water sources are increasingly getting depleted or are getting polluted, Bore wells are either silting up, getting short of water or are drawing polluted water.
4. Agriculture continues to be the single largest consumer of water however industrial demand for water shows the fastest growth.

B) Methods of rainwater harvesting in India

There are Primitives and Modern this two methods of rainwater harvesting the following as given below.

A) Primitives Methods of Rainwater harvesting:

1. Khadin/Dhara : First designed in Rajasthan in 15th century. It is an ingenious construction designed to harvest surface runoff water for agriculture. It is built across the lower hill slopes lying below gravelly uplands sluices & spillways allow excess water to drain off. This system used saturated rainwater on far land which is used for crop production.
2. Bavadi/vavdi : They are traditional step wells in Gujarat & Northern India they were constructed in 8th to 11th century CE 11 to 12 century CE 13 to 15 Century CE. They were located within or at edge to the village which were used for utilitarian purpose & cool place for social gathering.
3. Ahar /Pynes : It was flood water harvesting system found in south Bihar. Ahar is catchment basin embanked on three sides, the fourth side the natural gradient of the land itself, it was used to grow rabi crops. Pynes are artificial channels constructed to utilize river water in agricultural fields 10 km to 20 km from river. In 1995 Dhira Village youths in Bihar started Ahar pynes system which completed in 2000. It has integrated 80 million hectares of land which was used to grow two cereal crops & vegetables every year

4. Bengal's Inundation Channel: Williams will cocks British irrigation expert has given distinct features. Cuts in the banks of the canals were closed when flood water was over.
5. Kohli tanks : Group of villagers/cultivators constructed 43,381 water tanks in the district of Bhandara(Maharashtra) before 25 year ago. The tanks of all sizes which bring water to door-step of villagers. They are two types Bhandara and Phad.

B) Modern method of Rainwater harvesting : Particularly in urban areas the most suitable method of rainwater harvesting has following important components.

1. Catchment : In urban area the apartment system of housing is most widely used. In this apartment system or even in the separate individual bungalows system the rainwater can be catched on cement concrete terrace where directly rain falls.

2. Conduits : Conduits are the pipelines that carry rainwater from catchment area to harvesting system

3. First Flushing: The first flush device is a device that flushes out first spell of polluted rain water.

4. Filter : It is a unit which contains filtering media like fiber coarse. Coarse-sand to filter rainwater.

5. Storage facility: The storage tanks can be of cylindrical rectangular & square shape. They can be of plastic or Metal

6. Recharge structure: Rain water can be used for recharging the ground water through dug wells & bore wells which can promote percolation of water through soil at shallower.

How to Ways of harvesting rainwater:

1) Surface runoff harvesting:

In urban area rainwater flows away as surface runoff. This runoff could be caught and used for recharging aquifers by adopting appropriate methods. Urbanization increases surface runoff, by creating more impervious surface such as pavement and buildings that do not allow percolation of the water down through the soil to the aquifer. It is instead forced directly into streams or runoff drains, where erosion and siltation can be major problems, even when flooding is not. Increased runoff reduces groundwater recharge, thus lowering the water table and making droughts worse, especially for farmers and others who depend on the water wells.

2) Roof top rainwater harvesting (RTRWH):

It is a system of catching rainwater where it falls. In rooftop harvesting, the roof becomes the catchments, and the rainwater is collected from the roof of the house/building. It can either be stored in a tank or diverted to artificial recharge system. This method is less expensive and very effective and if implemented properly helps in augmenting the ground water level of the area. The main Objective of rooftop rain water harvesting is to make water available for future use. Capturing and storing rain water for use is particularly important in dry land, hilly, urban and coastal areas'

Step by step process for rainwater harvesting:

Calculate water harvesting potential and match with the water demand

$$\text{Total volume of water} = \text{Area} \times \text{runoff coefficient} \times \text{rainfall}$$

There is some loss of water due to evaporation or absorption by catchment surfaces and other kinds of losses. The runoff coefficient of a catchment gives you the proportion of the rainwater that can be harvested from the total rainfall.

Decide the type, capacity and location of structures:

There are two main techniques of rain water harvestings as given

1. Storage of rainwater on surface for future use
2. Recharge to ground water.

Whether to store rainwater or use it for recharge. in Case Study area

The decision whether to store or recharge water depends on the rainfall pattern and the potential to do so, in a particular region. The sub-surface geology also plays an important role in making this decision.

In places like Delhi, Rajasthan and Gujarat where the total annual rainfall occurs during 3 or 4 months are example of places where groundwater recharge is usually practiced. In places like Kerala, Mizoram, Tamilnadu and Bangalore where rain falls throughout the year barring a few dry periods, one can depend on small sized tank for storing rainwater, since the period between two spells of rain is short. Where the sub-strata are impermeable, recharging will not be feasible. Hence, it would be ideals to opt for storage

In places where the groundwater is saline or of potable standers, the alternate system could be that of storing rainwater. Beyond generalizations, it is the requirement that governs the choice of water harvesting technique.

For example in Ahmadabad, which has limited number of rainy days as that of Delhi, traditional rainwater harvesting tanks known as 'tanks' are used to store rainwater even today in residential a area temples and hotel.

C) Changing Pattern of Water management in ancient to modern Age.

1. Indian water conservation ancient methods

The Indus valley civilization, that flourished along the bands of the river Indus and the parts of western and northern India about 5,000 years ago, had one of the most sophisticated urban water supply and sewage systems in the world. The fact that the papers were well acquainted with hygiene can be seen from the covered drains running beneath the streets of the ruins at both Mohenjo-Daro and Harappa.

One of the oldest water harvesting systems if found about 130 km from pune along Naneghat in the Western Ghats. A large number of tanks were cut in the rocks to provide drinking water to tradesmen who used to travel along this ancient trade route. Each fort in the area had it is own water harvesting and storage system in the form of rock-cut cisterns, ponds, tanks and wells that are still in use today. A large number of forts like Raigad had tanks that supplied water.

In ancient times, houses in parts of western Rajasthan were built so that each had a rooftop water harvesting system. Rainwater from these rooftops was directed into underground tanks. This system can be seen even today in all the forts, palaces and houses of the region. Underground baked earthen pipes and tunnels to maintain the flow of water and to transports it to distant places, are still functional at Burhanpur Madhya Pradesh, Golconda and Bijapur in Karnataka, and Aurangabad in Maharashtra.

2. Central Government legislation:

Integrated waters management program is a modified programme of erstwhile Drought Prone Areas Programme (DPAP), Desert Development Programme (DDP) and Integrated Wastelands Development Programme (IWDP) of the Department of Land Resources. This consolidation is for optimum use of resources, sustainable outcomes and integrated planning. The scheme was launched during 2009-10. The programme is being implemented as per Common Guidelines for Watershed Development Projects 2008. The main objectives of the IWMP are to restore the ecological balance by harnessing, conserving and developing degraded natural resources such as soil, vegetative cover and water. The outcomes are prevention of soil erosion, regeneration of natural vegetation, rain water harvesting and recharging of the ground water table. This enables multi-cropping and the introduction of diverse agro-based activities, which help to provide sustainable livelihoods to the people residing in the watershed area. The Salient features of IWMP are as below:

(I) setting up of Dedicated Institutions with multi-disciplinary experts at State level - State Level Nodal Agency (SLNA), District level - Watershed Cell cum Data Centre (WCDC), Project level - Project

- Implementing Agency (PIA) and village level watershed committee (WC.)
- (ii) Cluster Approach in selection and preparation of projects: Average size of project - about 5,000 ha.
 - (iii) Enhanced Cost No3 rms from Rs. 6000 per ha to Rs. 12,000/ha. in plains; Rs. 15,000/ ha in difficult/hilly areas.
 - (iv) Uniform Funding pattern of 90:10 between Centre & States.
 - (v) Release of central assistance in three installments (20%, 50% & 30%) instead of five installments and Flexibility in the project period i.e. 4 to 7 years and delegation of power of sanction of projects to State.
 - (vi) Scientific planning of the projects by using IT, remote sensing techniques, GIS facilities for planning and monitoring & evaluation
 - (vii) Earmarking of project funds for DPR preparation (1%), Entry point activities (4%), Capacity building (5%), Monitoring (1%) and Evaluation (1%).
 - (ix) Introduction of new livelihood component with earmarking of project fund under Watershed Projects i.e. 9% of project fund for livelihoods for asset less people and 10% for production system & micro-enterprises

3. Maharashtra Government legislation:

Maharashtra government is promoting RTRWH under the “ Shivkalin Pani Sathwan Yojana” it provides that all house should have provision for rainwater harvesting without which house construction plan should not be approved. Bombay Municipal Corporation and Pimpri-Chinchwad Municipal Corporation have made RWH mandatory by enacting building bye-laws.

The state government has rainwater harvesting mandatory for all buildings that are being constructed on plots that are more than 1,000 sq.m. in size. The deadline set for this was October, 2002.

4. Benefits of rainwater harvesting

Development and augmentation of freshwater supplies through installation of RWH systems will offer following benefits compared of conventional strategies.

1. They provide relatively high quality water (in most areas) soft and low in minerals at low costs.
2. Direct capturing of rainwater significantly reduces our reliance on water from
3. Dams/reservoirs and canal systems. This will exert less pressure on national water storage capacity at macro-level and can potentially reduce the need to expand dams or build new ones.
4. Capturing rain water likelihood of overloading storm water systems in the neighborhood.
5. Reduces soil erosion and flooding typically create by storm water run-off in urban areas of India.
6. Encourage households and institutions to be equipped with an on-site and decentralized water supply of reliable quality.
7. Reduces silting and contamination of waterways from polluted surface run-off and Helps to create mass awareness and appreciation for conservation of water resources.

CONCLUSION:

1. Rainwater harvesting is emerging as a viable long-term strategy to tackle the increasing pressure on freshwater resources of our country. Harvesting rainwater to utilize directly for beneficial use such as potable or non-potable domestic uses, livestock drinking and irrigation would be the most financial involvement required on the part of community or household to properly run and maintain systems to facilitate such uses may pose practical constraints in wider adoption RWH practices.
2. While some type of financial incentives can be devised to overcome the constraints, it is advisable to adopt a step-by-step strategy through promotion less-taxing RWH practices such as artificial recharge to demonstrate the benefits thereby bringing greater awareness of the community. With greater awareness among the communities, it will be easier to disseminate and promote RWH practices that require higher user involvement.
3. Andaman & Nicobar, Lakshadweep. MH, MP, TN, UP and Karnataka have initiated action for the purpose of RWH. Other states have passed the laws to implement the RWH but the schemes have not been materialized effectively. Awareness amongst the people must be created. Only rules and laws increasing demand and mismanagement of water is responsible for water crisis.
4. Water management is the need of the hour to attain food security, fight against global warming and poverty in India
5. Rainwater harvesting is the best method of water management.

A STUDY OF CHANGING PATTERN OF RAIN WATER HARVESTING MANAGEMENT.....

6. Rainwater harvesting has been done in India since long. It is not a new concept.
7. Need of the hour is to apply modern technology for rainwater harvesting for better water management and will not help to tackle the water problem. In highly populated agrarian country like India water crisis is a serious problem
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